# COMMUNICATIONS SYSTEM AND METHOD WITH CALL EXPENDITURE CONTROL

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention:

This invention relates to communication systems. More particularly, the invention relates to a communications system and method for budgeted payment of communication services using stored information in the communication system.

### 2. Description of Prior Art:

Pre-paid telephone services is one form of budgeted telephone calling which enable a customer to budget and control telephone calling expenditures in advance of calling. One example of such service is a pre-paid calling card which is issued in a given monetary amount and/or calling time after payment by the customer. When the card amount or time is expended, the customer is required to repurchase another card which may be inconvenient and time consuming.

Another form of such budgeted service is a pre-paid calling time or amount stored in a communication system which is debited as the calling time is expended. A customer is required to make arrangements with the communications system to renew the calling time which, again, may be inconvenient and time consuming. What is needed is a budgeted calling amount, pre-paid or post paid, uniquely related to a caller's telephone number, the budgeted amount being stored in a communications system which automatically provides the caller with pre-defined options for renewing or terminating the budgeted amount prior to or after the amount has been expended.

Prior art related to budgeted telephone calling service includes the following:

U.S. Pat. No. 4,706,275 issued Nov. 10, 1987, discloses a telephone system enabling pre-payment for telephone calls wherein a special code and credit information is stored in special exchanges and debited as the call progresses. The call is disconnected when the pre-payment amount has been spent without any automatic arrangement for renewing the pre-payment amount.

U.S. Pat. No. 5,265,155 issued Nov. 23, 1993, and 5,440,621 issued Aug. 8, 1995, disclose a method for storing telecommunication time data representative of a pre-purchased amount in a network. A telecommunications connection is established between first and second telecommunication devices. When the connection is terminated, the time duration of the connection is measured. The stored telecommunication time data is processed to indicate a decrement in the available time which is essentially equal to the measured time duration of the connection.

U.S. Pat. No. 5,353,335 issued Oct. 4, 1994, discloses a pre-paid telephone system in which a telephone user buys a predetermined amount of service beforehand and receives a card imprinted with the unique account number. A plurality of toll-free access numbers allow the user to access a pre-paid telephone system. Each of those numbers causes the pre-paid system to interact with the user if the user has enough available credit to pay for at least a minimal amount of calling time, a call is completed. A timer is set with the amount of calling time permitted by the available balance. The timer runs during the course of the phone call and the call is disconnected when the timer runs out. If the call is ended prior to the timer running out, a new available balance

is computed in light of the time remaining on the timer. The user can make additional phone calls using the new available credit balance.

None of the prior art discloses a communications system including budgeted calling amounts uniquely identified with a caller for directly calling a called party without using a special toll number or credit card, the budgeted amounts being stored in the system and debited as calling connections take place whereupon the system provides automatic pre-defined courses of action for pre-paid or post paid service for call completion upon expenditure of the budgeted amount in extending or renewing the budgeted amount or terminating the budgeted calling services.

## SUMMARY OF THE INVENTION

A communications system which includes at least one network switch coupled in part to at least one caller via a telephone line uniquely associated with that caller for receiving a call from that caller to a destination and establishing the caller's identity in accordance with a number associated with the caller's telephone line. A data base stores information in accordance with the caller's telephone number, the information including budgeted calling amount for the caller. A control processor is responsive to a call initiated by the caller for accessing the data base to obtain the information in accordance with the caller's telephone line number and establishing a maximum allowable time for the caller's call based on the information and the destination of the caller's call. The processor monitors the call in progress to determine how much time has elapsed. A voice response unit is coupled to the processor and to the network for sending at least one message to the caller indicative of the amount of time available to the caller as the call progresses. Prior to the expenditure of the budgeted calling amount, the system provides the caller with several options. In one option, the call may terminate when the budget amount is exceeded. In a another option, the call may continue subject to a warning that the call budget has been exceeded with a prompt to obtain additional budgeted calling time and costs for updating the recorded amounts in the system. In still another option, the call and subsequent calls may continue subject to later payment by the customer. All calls are placed to called parties without accessing special toll numbers or the use of credit cards.

## DESCRIPTION OF THE DRAWING

FIG. 1 is a block diagram of the communication network including a call expenditure control server incorporating the principles of the present invention.

FIG. 2 is an architectural diagram of a control processor and the expenditure control server of FIG. 1.

FIG. 3 is a flow diagram of a call expenditure control program that runs in the control processor of FIG. 2.

FIG. 4 is an alternate embodiment of FIG. 2 in which data bases in the expenditure control server are distributed throughout the network.

FIG. 5 is a block diagram of another embodiment for connecting the call expenditure control server to a customer.

FIG. 6 is a block diagram of a cellular network which incorporates the principles of the present invention.

## DESCRIPTION OF PREFERRED EMBODIMENT

FIG. 1 discloses a communications network 100 which in one form may be a Common Channel Signal Network (CCSN) coupled to a plurality of network switches 80 and

90, such as Electronic Switching System No. 4 (4ESS) for completing calls between local telephones 50, 54. Local Exchange Carriers (LEC) 52 and 56, respectively, are connected to the phones 50 and 54 through links 50' and 54', respectively. The local exchange carriers are also connected to the network switches 80 and 90, through links 52' and 56', respectively. The network 100 is also connected to a Call Expenditure Control Server 125 including a network switch 106 coupled to a control processor 102 through link 105 and to a Voice Response Unit 104 through a link 107. The voice response unit and control processor 102 are connected together through a link 103.

The server 125 provides budgeted calling service, either pre-paid or post paid, to customers using the phones 50, 54 . . . . The customer obtains the prepaid, budgeted calling service by calling a Customer Service Representative and ordering the service for his unique telephone line. The service enables the caller to place a call directly to a called party without accessing a special toll number or using a credit card. The customer sets the purchase limit threshold and determines whether a "Hard-Stop" or a "Soft-Stop" service will be implemented when a budgeted calling monetary amount is about to be exceeded. In a "hard-stop" option, the customer will receive a balance depletion warning stating "YOU HAVE TWO MINUTES OF CALL TIME REMAINING ON YOUR BUDGETEDD BALANCE." The customer will be disconnected upon the expiration of the two-minute warning notice. Alternatively, if selected in advance, the customer will hear "YOUR BUDGETED BALANCE HAS BEEN EXPENDED. THIS CALL MAY BE CONTINUED FOR A CHARGE TO YOUR REGULAR ACCOUNT." In subsequent call-attempts after the customer has reached his budgeted balance limit, the customer hears the announcement "YOU HAVE DEPLETED YOUR BUDGETED BALANCE FOR THE MONTH, PLEASE CALL 1-800-555-5555 IF YOU WOULD LIKE TO MODIFY YOUR PURCHASE LIMIT." and the call is blocked. The timer stops for the option announcement and restarts at the end of the announcement so that the customer does not get billed for the duration of the announcement.

In the "soft-stop" option, when the customer reaches the end of the prepaid purchase balance limit, the customer receives the announcement, "YOU HAVE REACHED YOUR LIMIT BUT WILL BE ALLOWED TO CONTINUE TO TALK. IF YOU WOULD LIKE TO REPLENISH/ MODIFY YOUR PURCHASE LIMIT, PLEASE CALL 1-800-555-5555". The announcement is heard only by the calling party and the call is allowed to continue. The timer stops for the announcement and restarts at the end of the announcement so that the customer does not get billed for the duration of the announcement. On subsequent toll call attempts after the customer has reached the budgeted amount, the customer hears the announcement, "YOU HAVE DEPLETED YOUR BUDGETED BALANCE FOR THE MONTH" and the call is set up (on subsequent calls, the customer will be reminded that the balance has been exceeded, but the call precedes as normal although the threshold has been exceeded). The charges for such calls and subsequent calls are billed to the customer's regular telephone account for the unique telephone line.

Thus, the present invention provides the customer with a convenient and efficient mechanism for continuing budgeted calling without accessing a special toll or using a credit card, except contacting the local service representative or an "800" number to renew or modify the budgeted amount, thereby saving time for extending the service and overcoming the limitation of the prior art.

Turning to FIG. 2, the control processor 102 in the control server 125 (see FIG. 1) includes a memory 202 coupled through a buss 204 to a disk drive storage 206; an I/O adapter 208 coupled to the voice response unit 104 through link 103; an I/O adapter 210 coupled to the network switch 106, through the link 105 and a processor 212 for executing the stored program instructions in the memory 202. A call expenditure control program 224 monitors each budgeted telephone call and implements a "hard-stop" or "soft-stop" option according to the customer preference. A rating table database 230 records the time and dollar balances for each prepaid, budgeted customer. The rating table is decremented as the call is monitored by the call expenditure control program 224. An announcement database 232 contains the announcement for the "soft-stop" and "hardstop" options. The database 232 also includes a welcoming announcement advising the customer at the time of call placement of the time and dollar balance available at the beginning of the call. Optionally, the programs 230 and 232 may be installed as an adjunct platform to a network switch routing the budgeted call. A voice response unit control program 222 is activated by the call expenditure control program 224 to supply the announcement in the database 232 at the appropriate time in a budgeted call. A network switch control program 220 interfaces with the network switch 106 for monitoring the call and sending the announcements.

In FIG. 3, the call flow from a customer subscribing to the budgeted calling service is initiated in an operation 402 in which the calling party connects to the network 100 as a regular toll call using the prefix digit "1", unlike the prior art which uses special toll numbers and credit card numbers. The originating local exchange carrier delivers the call to the network switch 80, 90 as the case may be. In an operation 404, the originating switch performs an Automatic Number Identification Trigger Table (ANITT) Look-up in a provisioning database to determine if the ANI has call expenditure control service. Optionally, other software programs may be employed to perform the function of the Trigger Table. If the ANI 222 has a match, an operation 406 is performed to look-up routing information in a routing database to direct the call where the control server 125 is located. When the server receives the call, an operation 408 is performed in which the server looks at a rating table base to determine a time and dollar value for the customer placing the call. The server routes the call to the appropriate network switch while remaining hairpinned for the duration of the call. The network switch routes the call to the terminating local exchange carrier. The network switch also appends a special automatic machine accounting module containing budgeted calling service information. During call set up, the server plays an initial announcement to the calling party in an operation 410. The announcement states, "YOU HAVE A BALANCE OF $XX AND CAN SPEAK FOR XX MINUTE. THANK YOU FOR USING AT&T." The terminating local exchange carrier routes the call to the called party for completion. Once a connection is established, the server tracks the progress of the call using the control program 224 and decrements the time and dollar balance accordingly in the rating table data base 230. For a "hardstop" option, the server activates a warning announcement in an operation 412 when the customer has two or less than two minutes left on the call. The processor 102 activates the voice response unit control program 222 to send the announcement, "YOU HAVE 2 MINUTES REMAINING. IF YOU WOULD LIKE TO MODIFY YOUR PURCHASED LIMIT, PLEASE CALL 1-800-555-5555." The warning announcement is heard only by the calling party.